

Lifeline® Power Cables: RHW-2 Fire Resistive Cables in EMT Conduit and BreathSaver® XW Phenolic Conduit

UL 2196 Certified Fire Resistive Cable for Survivability in a Fire



Applications

Lifeline® fire resistive cables were designed to meet and have successfully passed the two hour fire rating certification test per UL 2196, *Standard for Tests for Fire Resistive Cables*.

Lifeline® Cables can be used in the following applications to provide survivability during a fire:

- Fire Pumps
- Emergency Feeder Cables
- Ventilating Fans
- Exit Lighting
- Tall Buildings
- Hospitals
- Transit
- Elevators

Lifeline® Cables are preferred over Mineral Insulated (MI) cables, concrete encasement or the construction

of fire rated assemblies based on the facts that Lifeline® Cables are less costly, easier to install, and readily available.

Fire resistive cables are required per NFPA 70, Articles 517, 695, 700, 708 and 760 as well as NFPA 72, NFPA 101, NFPA 130 and NFPA 502



RoHS
COMPLIANT



Specifications and Ratings

- Listed to UL 44, *Thermoset Insulated Wires and Cables*, as the following type:
 - RHW-2, 600 Volt, Rated 90°C Dry/90°C Wet
- Classified to UL 2196, *Standard for Tests for Fire Resistive Cables*, for two-hours.
- Electrical Circuit Integrity System (FHIT) No. 25C of the UL Fire Resistance Directory for horizontal installations in EMT conduit or BreathSaver® XW Phenolic conduit and vertical installations in BreathSaver® XW Phenolic conduit
- Sunlight Resistant
- FT4 Rated
- ST1
- IEEE 1202
- NFPA 70, NFPA 101, NFPA 130, NFPA 502 (when approved by AHJ)

Design Parameters

CONDUCTORS: Bare stranded copper, 8 AWG through 750kcmil

INSULATION: High Temperature Mica Tapes layer. Ceramifiable silicone, Low Smoke Zero Halogen (LSZH)

JACKET: Cross-linked polyolefin (XLPO), Low Smoke Zero Halogen

IDENTIFICATION:

MADE IN USA DRAKA MA P/N [#####] [X]AWG ([Y]mm²) LIFELINE® (UL) E2268 RHW-2 600V FT4 ST1 VW1 (UL) R19359 FRR 2 HR FHIT#25C UL 2196 480V UTILIZATION ([mm]/[yr]) [2FT]

Notes: [#] is cable part number
[X] is cable size in AWG or kcmil
[Y] is cable size in mm²

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Lifeline® Power Cable

LIFELINE® Part Number	Conductor Size AWG /MCM	Number of Strands	Insulation Thickness in (mm)	Overall Diameter in (mm)	Approximate Weight lbs./Mft (kg/km)	Ampacity ¹ 90°C Amps
G30064	8	7	0.060 (1.5)	0.31 (7.8)	84 (125)	55
G30065	6	7	0.075 (1.9)	0.37 (9.5)	129 (192)	75
G30066	4	7	0.075 (1.9)	0.42 (10.7)	185 (275)	95
G30067	3	7	0.075 (1.9)	0.45 (11.4)	224 (333)	115
G30068	2	7	0.075 (1.9)	0.48 (12.2)	269 (400)	130
G30069	1	19	0.100 (2.5)	0.57 (14.5)	364 (542)	145
G30070	1/0	19	0.100 (2.5)	0.61 (15.5)	441 (656)	170
G30071	2/0	19	0.100 (2.5)	0.65 (16.6)	535 (796)	195
G30072	3/0	19	0.100 (2.5)	0.70 (17.9)	656 (976)	225
G30073	4/0	19	0.100 (2.5)	0.76 (19.2)	803 (1195)	260
G30074	250	37	0.130 (3.3)	0.86 (21.9)	987 (1469)	290
G31501	300	37	0.130 (3.3)	0.92 (23.4)	1160 (1726)	320
G30075	350	37	0.130 (3.3)	0.97 (24.7)	1306 (1943)	350
G31496	400	37	0.130 (3.3)	1.02 (25.9)	1500 (2232)	380
G30076	500	37	0.130 (3.3)	1.10 (27.9)	1820 (2708)	430
G30077	600	61	0.145 (3.7)	1.21 (30.6)	2199 (3272)	475
G30078	750	61	0.145 (3.7)	1.31 (33.3)	2699 (4016)	535

Ampacities are based on Table 310.16 of the National Electrical Code (NFPA 70) for 3 current carrying conductors at 30°C ambient.

The above dimensions are approximate and subject to normal manufacturing tolerances. Information subject to change without notice.



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Lifeline® Power Cables: RHW-2 Fire Resistive Cables in EMT Conduit and BreathSaver® XW Phenolic Conduit

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Minimum Allowable Conduit Size												
Conductor Size	Horizontal Installation in EMT Conduit - Number of Conductors				Horizontal Installation in XW BreathSaver Conduit - Number of Conductors				Vertical Installation in XW BreathSaver Conduit - Number of Conductors			
	1	2	3	4	1	2	3	4	1	2	3	4
8	1/2	1	1-1/4	1-1/4	3/4	3/4	1	1	3/4	1	1-1/4	1-1/4
6	3/4	1-1/4	1-1/4	1-1/2	3/4	1	1-1/4	1-1/4	1	1-1/2	2-1/2	2-1/2
4	1	1-1/4	1-1/2	2	3/4	1	1-1/4	1-1/2	1-1/4	2	2-1/2	3
3	1	1-1/4	1-1/2	2	3/4	1-1/4	1-1/4	1-1/2	1-1/4	2	2-1/2	3
2	1	1-1/4	1-1/2	2	3/4	1-1/4	1-1/2	1-1/2	1-1/4	2-1/2	3	3
1	1-1/4	2	2	2-1/2	1	1-1/2	2	2-1/2	1-1/2	2-1/2	3-1/2	3-1/2
1/0	1-1/4	2	2-1/2	2-1/2	1-1/4	1-1/2	2-1/2	2-1/2	2	3	3-1/2	3-1/2
2/0	1-1/2	2	2-1/2	3	1-1/4	2	2-1/2	3	2	3	3-1/2	4
3/0	1-1/2	2-1/2	2-1/2	3	1-1/4	1-1/2	2-1/2	2-1/2	2-1/2	3-1/2	4	4
4/0	2	2-1/2	3	3	1-1/4	2	2-1/2	3	2-1/2	3-1/2	4	5
250	2	2-1/2	3	3	1-1/4	2-1/2	3	3	2-1/2	3-1/2	4	5
300	2	2-1/2	3	3-1/2	1-1/2	2-1/2	3	3-1/2	2-1/2	3-1/2	5	5
350	2	2-1/2	3	3-1/2	1-1/2	2-1/2	3	3-1/2	3	3-1/2	5	5
400	2	3	4	4	1-1/2	2-1/2	3-1/2	4	3	4	5	6
500	2-1/2	3	3-1/2	4	2	3	3-1/2	4	2-1/2	3-1/2	5	6
600	2-1/2	3	4	--	2-1/2	3	4	5	3	4	5	5
750	2-1/2	3-1/2	--	--	2-1/2	3-1/2	4	5	3	4	5	6

With AHJ approval, a larger size conduit may be required if an EGC is used.

The above dimensions are approximate and subject to normal manufacturing tolerances. Information subject to change without notice.

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Manufacturer's Instructions for Lifeline® Power Cables

Lifeline® RHW-2 Two-Hour Fire Resistive Cables in EMT Conduit and BreathSaver® XW Phenolic Conduit

Technical Information Sheet #301H

BreathSaver is registered trademark of FRE composites

This Technical Information Sheet (TIS) covers Lifeline® RHW-2 Cables: UL Certified and Listed Two Hour Fire Resistive Cable for use in EMT Conduit and BreathSaver® XW Phenolic Conduit

Applications

Lifeline® Power Cables have been qualified and listed to the demanding requirements of UL 2196, Tests for Fire Resistive Cables, and are UL Listed Type RHW-2.

Lifeline® Power Cables meet various industry code requirements (NFPA 70, NFPA 101 and NFPA 130) for fire resistance according to UL Standard 2196 when selected and installed per applicable codes including federal, state, local and municipal rules, laws and regulations as well as Electrical Circuit Integrity System 25C (FHIT 25C) and TIS #301H - Manufacturer's Instructions. NFPA 502 can also be met when approved by an AHJ. Note that Authorities Having Jurisdiction (AHJ) should be consulted for approval prior to cable purchase and installation.

Requirements

1) Codes / Laws / Regulations

Selection and installation compliance is dependent on the applicable issue of any codes or addendums which covers the use of Lifeline® RHW-2 Cables, Fire Resistive Cables.

2) UL Electrical Circuit Integrity System #25C (FHIT 25C)

The most current listing details and supporting information applicable to Lifeline® Cables' fire resistive rating classification can be obtained from UL's UL Product IQ website by searching for keyword: "FHIT 25C".

3) Manufacturer's Instructions – TIS #301H

All Lifeline® Cable products are covered by specific datasheets and supporting Technical Information Sheets that provide the user with information to properly select and install Lifeline® Cables in a reliable and trouble-free manner. Do not hesitate to contact your Lifeline® Cable representative should you have any questions.

Installation Parameters

1) Cable: Lifeline® RHW-2

Code compliant cable certified as two-hours fire resistive with 480 volts utilization per testing according to UL 2196 and listed in FHIT 25C. Appropriate cable selection is required for systems requiring a fire resistive rating.

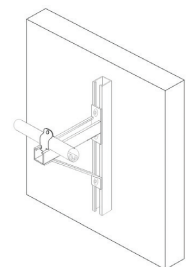
2) Fire Resistive Cable System

Code compliant conduit system which meets the following requirements:

- a. Horizontal installations must use either BreathSaver® XW Phenolic Conduit with optional ResolveOne NEMA 4X Enclosures as pull boxes with BreathSaver® XW Phenolic conduit assembly components, or Allied or Western EMT conduit with optional Wiegmann NEMA 3R enclosures as pull boxes with Raco steel compression assembly components. Vertical Installations must use BreathSaver® XW Phenolic Conduit with optional ResolveOne NEMA 4X Enclosures as pull boxes with BreathSaver® XW Phenolic assembly components. EMT and NEMA 3R components are not approved for 2-hour rated vertical installations. Maximum allowable vertical distance is 24 feet. For easier installation Polywater LZ pulling lubricant may be used. No substitute components are allowed.

- b. Conduit assemblies shall be secured to a fire rated structure comprised of steel or other fire rated components proven to meet the required fire resistance ratings (i.e. two hours).

Note: Installations where BreathSaver® XW Phenolic Conduits run parallel to and extend away from the support structure require additional support. In such an installation, the horizontal support members shall be reinforced with a knee brace or equivalent. The drawing to the right shows an example installation with knee brace installed. The knee brace shall be secured to vertical and horizontal structural members using 3/8in. or larger steel bolts. Recommended bracing material is steel at least ¼ inch thick with cross sectional area 0.3 in.² or greater.



Manufacturer's Instructions for Lifeline® Power Cables

Lifeline® RHW-2 Two-Hour Fire Resistive Cables in EMT Conduit and BreathSaver® XW Phenolic Conduit

Technical Information Sheet #301H

BreathSaver is registered trademark of FRE composites

c. Maximum support spacing shall be

- EMT conduit shall be supported every five feet (60 inches)
- BreathSaver® XW Phenolic Conduit shall be supported in accordance with National Electric Code article 355.30 with exception that spacing for conduit sizes 2½ and larger shall not exceed 5ft.

d. When enclosures are used as pull boxes two-piece steel clamps shall be used to secure conduit within one foot from enclosure. When BreathSaver® XW Phenolic Conduit is used conduit connectors shall also be secured using two-piece steel clamps.

3) Conduit Sizing

Lifeline® RHW-2 FHIT.25C datasheet issued August 2020 provide cable diameters and conduit fill which shall be used in lieu of the typical National Electrical Code maximum conduit fill requirements.

4) Pull Boxes

If pull boxes are used, enclosure size shall be at least 8 times the raceway trade size in accordance with National Electric Code article 314.28. Installations in EMT conduit shall use Wiegmann NEMA 3R enclosures. For enclosures 12 inches or less across Wiegmann series RSC with lift-off screw cover or RHC with hinged cover may be used and enclosures 16 inches or greater across shall use Wiegmann a RHC with hinged cover. Order model number comprised of series number prefix followed by two digit height, width and depth dimensions.

Examples:

An installation with 1-1/4 inch EMT requires an enclosure 10 inches across and Wiegmann RSC101004 enclosure shall be used.

An installation with 3 inch EMT requires an enclosure 24 inches across and Wiegmann RHC242408 enclosure shall be used.

4) Pull Boxes (Continued)

Installation in BreathSaver® XW Phenolic conduit shall use Resolve One Stainless Steel NEMA 4X enclosures. ResolveOne 4X JIC Style JHFX series enclosures shall be used for sizes 12 inches or less across and 4X NEMA Style NFX series shall be used for enclosures 16 inches or greater across. Order model number comprised of AB-R prefix followed by two digit height, width and depth dimensions JHFX or NFX style series, 3 or 4 to describe finish polish, T304 for grade of stainless steel, and HT suffix denoting high temperature gasket.

Examples:

An installation with 1-1/4 inch BreathSaver® XW Phenolic conduit requires an enclosure 10 inches across and ResolveOne AB-R101004JHFX3T304HT enclosure shall be used.

An install installation with 3 inch BreathSaver® XW Phenolic conduit requires an enclosure 24 inches across and ResolveOne AB-R242406NFX3T304HT enclosure shall be used.

Installations using NEMA 4X enclosures shall include an Eaton Crouse - Hinds breather/drain P/N DPE1029S3 installed on the bottom of pull box enclosure.

5) Connector Insulation Bushing

When NEMA 3R pull boxes are installed in application using EMT conduit the EMT connector shall have insulating bushing installed after cable has been pulled in. Insulation bushings are flexible silica insulation that is installed under cable inside connector nipple. The bushing dimensions shall be 3 inches by at least half the connector nipple internal circumference. The installed cables shall be lifted and insulating bushing inserted 2½ inches into connector with ½ inch outside connector folded over connector threads. The bushing shall be secured in connector by circumferentially wrapping connector threads and exposed bushing with at least three layers of 3M 69 Glass Cloth tape. Insulating bushings are available from Prysmian, order part number CUSEMT-DDD, where DDD is conduit trade size

Examples:

An installation with 1-1/4 inch EMT requires one kit of CUSEMT-125

An installation with 3 inch EMT requires one kit of CUSEMT-300

6) Raceway Transitions

Raceway transitions between EMT and BreathSaver XW® Phenolic conduit shall use Stainless Steel NEMA 4X enclosures described above for use with BreathSaver XW® Phenolic conduit at point of raceway transition. The enclosure shall be at least 8 times trade size of largest raceway. Instructions above to secure raceways and install EMT connector insulation bushings shall be done as applicable to each raceway at transition.



FHIT.25C - Electrical Circuit Integrity Systems

Design/System/Construction/Assembly Usage Disclaimer

- Authorities Having Jurisdiction should be consulted in all cases as to the particular requirements covering the installation and use of UL Certified products, equipment, system, devices, and materials.
- Authorities Having Jurisdiction should be consulted before construction.
- Fire resistance assemblies and products are developed by the design submitter and have been investigated by UL for compliance with applicable requirements. The published information cannot always address every construction nuance encountered in the field.
- When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the general Guide Information for each product category and each group of assemblies. The Guide Information includes specifics concerning alternate materials and alternate methods of construction.
- Only products which bear UL's Mark are considered Certified.

FHIT - Electrical Circuit Integrity Systems

[See General Information for Electrical Circuit Integrity Systems](#)

System No. 25C

October 15, 2020

Fire-Resistive Rating (FRR) - 2 Hr.

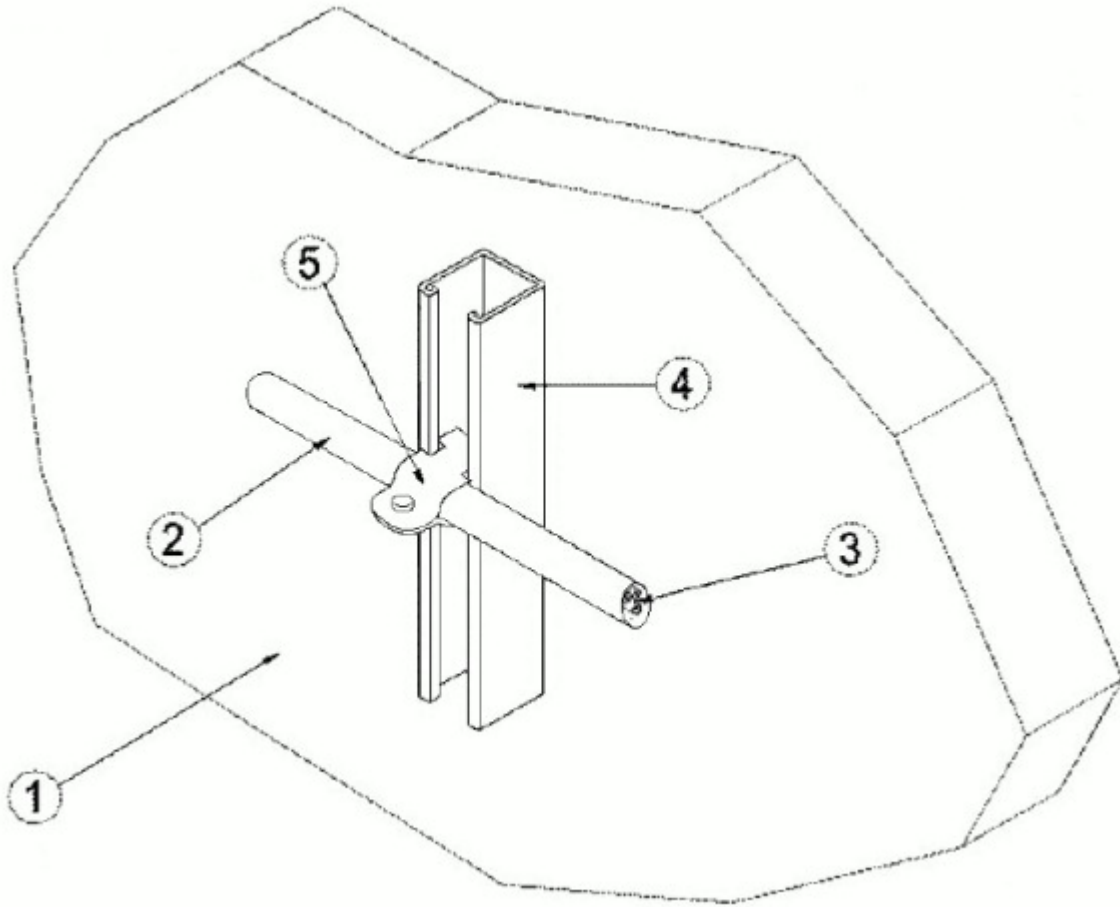


Fig. 1
Two-piece Single-bolt Pipe Clamp

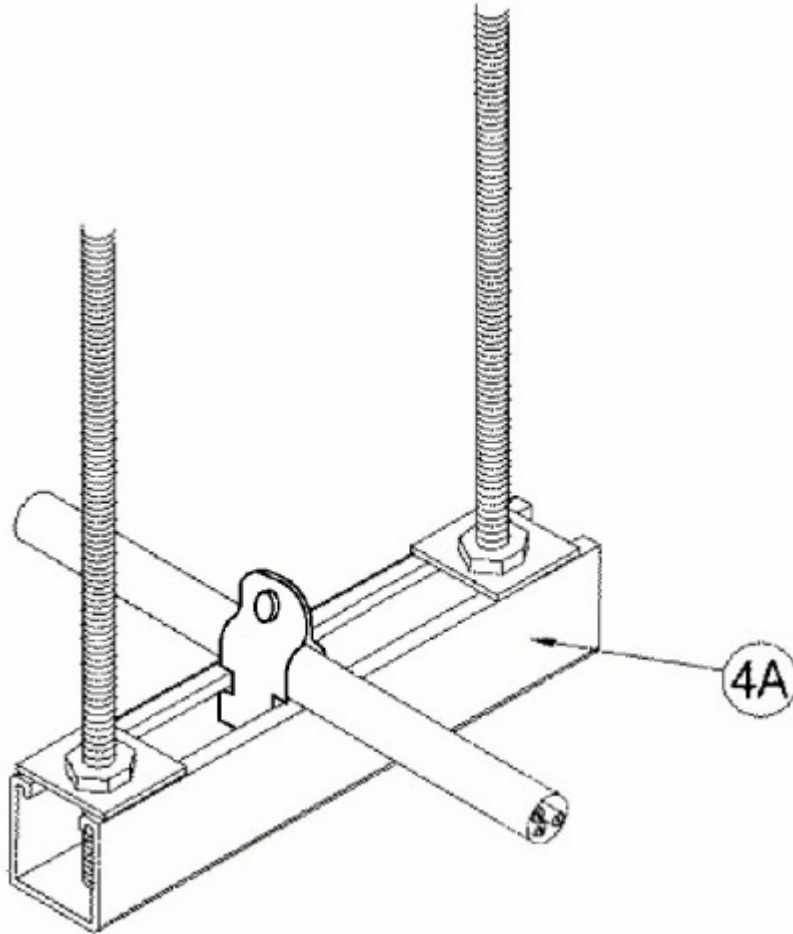


Fig. 2
Steel Strut Trapeze

1. **Wall or Floor Assembly*** — Minimum 2 hour fire rated concrete or masonry wall or concrete floor. Opening in wall or floor through which raceway passes is to be sized to closely follow the contour of the raceway. Through opening in wall or floor to be firestopped using a compatible firestop system.

See **Through-penetration Firestop Systems** (XHEZ) category for presently Certified firestop systems.

2. **Raceway*** — Reinforced Thermosetting Resin Conduit. Horizontal or Vertical installation; or EMT type steel conduit. Horizontal installation.

FRE COMPOSITES INC — BreathSaver Brand Type XW Conduit and Type XW elbows as follows:

Minimum XW Raceway Trade Size, in.

Cable Size, AWG/ kcmil	Horizontal Installation: No. of Cables				Vertical Installation: No. of Cables			
	1	2	3	4	1	2	3	4
	8	3/4	3/4	1	1	3/4	1	1-1/4
6	3/4	1	1-1/4	1-1/4	1	1-1/2	2-1/2	2-1/2
4	3/4	1	1-1/4	1-1/2	1-1/4	2	2-1/2	3
3	3/4	1-1/4	1-1/4	1-1/2	1-1/4	2	2-1/2	3
2	3/4	1-1/4	1-1/2	1-1/2	1-1/4	2-1/2	3	3
1	1	1-1/2	2	2-1/2	1-1/2	2-1/2	3-1/2	3-1/2
1/0	1-1/4	1-1/2	2-1/2	2-1/2	2	3	3-1/2	3-1/2

2/0	1-1/4	2	2-1/2	3	2	3	3-1/2	4
3/0	1-1/4	1-1/2	2-1/2	2-1/2	2-1/2	3-1/2	4	4
4/0	1-1/4	2	2-1/2	3	2-1/2	3-1/2	4	5
250	1-1/4	2-1/2	3	3	2-1/2	3-1/2	4	5
300	1-1/2	2-1/2	3	3-1/2	2-1/2	3-1/2	5	5
350	1-1/2	2-1/2	3	3-1/2	3	3-1/2	5	5
400	1-1/2	2-1/2	3-1/2	4	3	4	5	6
500	2	3	3-1/2	4	2-1/2	3-1/2	5	6
600	2-1/2	3	4	5	3	4	5	5
750	2-1/2	3-1/2	4	5	3	4	5	6

ALLIED TUBE & CONDUIT CORPORATION — Type EMT E-Z Pull Brand

WESTERN TUBE & CONDUIT CORP — Type EMT

Minimum EMT Raceway Trade Size, in.

Horizontal Installation: No. of Cables

Cable Size, AWG/ kcmil	1	2	3	4
8	1/2	1	1-1/4	1-1/4
6	3/4	1-1/4	1-1/4	1-1/2
4	1	1-1/4	1-1/2	2
3	1	1-1/4	1-1/2	2
2	1	1-1/4	1-1/2	2
1	1-1/4	2	2	2-1/2
1/0	1-1/4	2	2-1/2	2-1/2
2/0	1-1/2	2	2-1/2	3
3/0	1-1/2	2-1/2	2-1/2	3
4/0	2	2-1/2	3	3
250	2	2-1/2	3	3
300	2	2-1/2	3	3-1/2
350	2	2-1/2	3	3-1/2
400	2	3	4	4
500	2-1/2	3	3-1/2	4

600	2-1/2	3	4	—
750	2-1/2	3-1/2	—	—

2A. **Raceway Coupling*** — (Not Shown).

FRE COMPOSITES INC — BreathSaver Brand Type XW coupling. Trade size to correspond with the type XW raceway size

RACO — Steel (all components) EMT Compression Couplings. Trade size to correspond with the EMT raceway size.

3. **Fire Resistive Cables*** — The hourly fire rating applies to cable passing completely through a fire zone and terminating a minimum of 12 inches beyond the fire rated wall or floor bounding the fire zone.

PRYSMIAN CABLES AND SYSTEMS USA LLC — Type RHW-2 Lifeline Brand of the following part numbers: G300 followed by 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 77, 78; or G31501 or G31496. To be installed as described herein and in accordance with the manufacturer's installation instructions SPL-FPT-0013 (TIS301H) dated Sep 2020, SPL-FPT-0012 dated Sep 2020.

4. **Supports** — (Figure 1) — Min 12 gauge, by 1-1/2 in. wide or 1-5/8 in wide, painted or unpainted, slotted steel channels with hemmed flange edges. Channel bottom with or without holes. Lengths of slotted steel channels 5 ft and less shall be secured to the wall or floor with a min of two 1/4 in. diameter (or larger) by 2-1/4 in. min long concrete screws, or 1/4 in. diameter (or larger) by 1-3/4 in. long min steel masonry anchors. One screw or anchor to be located at each end of the slotted steel channel. Lengths of slotted steel channel in excess of 5 ft require a min of three screws or anchors, one at each end of the channel and one centrally located within the length of the channel. The supports shall be spaced a maximum of 5 ft. OC. When installing cable(s) in vertical runs, the maximum distance of cable within raceway shall be 24 ft.

4A. **Trapeze-type Supports** — (Figure 2) — The raceways shall be installed on/from trapeze-type supports. The trapeze-type supports shall be secured from the surface of the floor. The supports shall be spaced a maximum of 5 ft. OC.

5. **Clamps** — Steel 1-1/4 in. wide two-piece single-bolt pipe clamps. Size to correspond with the outside diameter of the raceway and as follows: Trade size 3/4-2 in. conduit, min 14-gauge; Trade size 2-1/2 in. conduit, min 12-gauge; Trade size 3 in. and larger conduit, min 11-gauge.

6. **Pulling Lubricant** — (Not Shown) — When installing cables within a raceway, the cables shall be coated with pulling lubricant.

AMERICAN POLYWATER CORP — Polywater LZ

7. **Pull Box** — (Optional Not Shown) — Cables installed in the horizontal or vertical orientation within type XW raceway, or in the horizontal orientation within EMT raceway, may utilize a Resolve One NEMA-4X stainless steel industrial control panel enclosure. Refer to the manufacturer's installation instructions, for additional details.

7A. **Box Connector** — (Not Shown) - For installation with item 7.

FRE COMPOSITES INC — BreathSaver Brand Type XW box connector. Trade size to correspond with the type XW raceway size.

8. **Pull Box** — (Optional Not Shown) — Cables installed in the horizontal orientation within EMT raceway may utilize a Wiegmann NEMA-1 steel cutout box enclosure. Refer to the manufacturer's installation instructions, for additional details.

8A. **Box Connector** — (Not Shown) - For installation with item 8.

RACO — Steel (all components) EMT Compression Box Connector. Trade size to correspond with the raceway size.

9. **Insulating Bushing** — For installation with item 8A. Prysmian P/N CUSEMT. Refer to the manufacturer's installation instructions, for additional details.

*Bearing the UL Classification Mark

Last Updated on 2020-10-15

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SPECIFICATION FOR CERTIFIED BreathSaver® XW FOR CORROSION PROOF 2-HOUR RATED CABLE SYSTEM (UL 2196 | FHIT 25C)

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SECTION 1: DESCRIPTION & LISTING

1.1 Description

This specification outlines the requirements for the design, construction and performance of the Extra Heavy Wall (XW) BreathSaver® Reinforced Thermosetting Resin Conduit (RTRC) and fittings.

1.2 Product application & use

Conduits and fittings are Class 1, Division 2 which can be subject to physical damage per NEC®.

1.3 Materials

Conduits and fittings shall consist of continuous E or E-CR glass roving in a cured corrosion resistant phenolic resin system pigmented with UV inhibiting carbon black dispersed homogeneously manufactured for use at temperatures ranging from -40 °F (-40 °C) to 1850 °F (1010 °C). No resorcinol resin based system shall be allowed.

Phenolic resin system shall be impervious to a wide spectrum of chemicals. Conduit shall contain no halogens as chlorine and shall not contain other toxic materials in excess of trace levels limits compliant with OSHA requirements.

1.4 Joining Method

Each length of conduit is supplied with an integral bell on one end and spigot on the other end. All joints shall be adhesive bonded inside a bell end of even socket depth through out the raceway. Adhesive shall be supplied by the manufacturer of the conduit and shall have a minimum joint pull out load of 1 000 lb, (454 kg) per inch diameter trade size.

1.5 Fittings

All fittings, adapters and elbows shall be constructed in the same manner as the conduit (filament wound) and shall have a socket depth and an inside bell design consistent with the conduit.

SECTION 2: DIMENSIONS

2.1 Sizes & wall thicknesses

Conduits and fittings shall be manufactured with nominal wall thicknesses as outlined below:

IPS EXTRA HEAVY WALL (XW)			
Diameter		Wall thickness	
in	mm	in	mm
¾	21	0.250	6.4
1	27	0.250	6.4
1 ¼	34	0.250	6.4
1 ½	41	0.250	6.4
8*	203	0.250	6.4

ID EXTRA HEAVY WALL (XW)			
Diameter		Wall thickness	
in	mm	in	mm
2	53	0.250	6.4
2 ½	63	0.250	6.4
3	78	0.250	6.4
3 ½	91	0.250	6.4
4	103	0.250	6.4
5	129	0.250	6.4
6	155	0.250	6.4

SECTION 3: REQUIREMENTS

3.1 Workmanship

Conduits and fittings shall be free from defects and commercially practicable in color, opacity, density and other physical properties. The exterior surface finish shall be smooth per acceptable industry practices.

3.2 Marking

Conduits and fittings shall be marked with a suitable identifying mark printed on the outside of the product. Such marking shall contain:

(1) RTRC (2) for use -40 °F (40 °C) to 1850 °F (1010 °C) (3) trade size (4) manufacturer's name or trademark (5) part number (6) degrees and radii (elbows only) (7) date of manufacture.

3.3 Specifications

All Conduits and Fittings are UL listed against UL 2515A following tests made in laboratory by Underwriters Laboratories (UL file #E53373).

Furthermore, products comply with the NFPA 130 as well as NFPA 502 for exposed installations, FT4 rated (CSA). Product identified in Section 2.1 with “*” is not UL Listed as 8” is not a recognized trade size dimension per National Electric Code (NEC) and Canadian Electric Code (CEC).

SECTION 4: PRODUCT PROPERTIES & CHARACTERISTICS

4.1 Physical Properties	Test Results	Test Protocol
Glass Content	71% ± 3%	API 15LR
Specific Gravity	1.93 g/cm ³ ± 2	ASTM D792
Barcol Hardness	50 ± 2	ASTM D2583
Water Absorption	≤ 1.5%	ASTM D570 CSA C22.2 No. 2515
U.V. Resistance	> 3 500 Hrs (Xenon Arc)	CSA C22.2 No. 2515
4.2 Flame & Smoke Properties	Test Results	Test Protocol
Flame Spread Index	0 (max: 35)	ASTM E84
Smoke Optical Density @ 4 minutes	1 (max: 200)	ASTM E662
Light Absorption	0% (no smoke generated)	SAV 242
Emissions NO ₂	5 ppm (max: 100 ppm)	SMP 800C
Emissions SO ₂	1 ppm (max: 500 ppm)	SMP 800C
Emissions HCl	< 2 ppm (max: 100 ppm)	SMP 800C
Emissions HF	< 2 ppm (max: 100 ppm)	SMP 800C
Emissions HBr	< 1 ppm (max: 100 ppm)	SMP 800C
Emissions HCN	< 1 ppm (max: 100 ppm)	SMP 800C
Emissions CO	604 ppm (max: 3 500 ppm)	SMP 800C
Emissions CO ₂	9585 ppm (max: 90 000 ppm)	SMP 800C
4.3 Electrical Properties	Test Results	Test Protocol
Dielectric Strength	500 volts/mil (19.68 kV/mm)	ASTM D149
Dielectric Breakdown Voltage	29.7 kV	ASTM D149
4.4 Surface finish		
Exterior (average)	<2000 microinches (50.8 micrometers)	
Interior (average)	<250 microinches (6.4 micrometers)	
Color	Black (standard)	
4.5 Thermal Properties	Test Results	Test Protocol
Coefficient of Thermal Expansion	1.40 E ⁻⁵ m./m./°C	ASTM D696
Thermal Conductivity	1.067 Btu.in/ft ² .h. °F (0.154W/ m.K)	ASTM D335
Thermal Resistivity	0.938°F. ft ² .h/Btu.in (6.502 mK/W)	ASTM D335
Heat Deflection Temperature (HDT)	>482°F (>250°C)	ASTM D648

SECTION 5: MANUFACTURER

Conduits and fittings shall be manufactured by FRE Composites. No substitute shall be accepted.

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FIRST IN THE FIELD

FRE composites.com

Redapt DPE increased safety (Exe) breather/drains

Cl. I, Zone 1, Ex e II
IECEX/ATEX
NEMA 4X
IP66

5F
5F

Features:

- International Ex approvals
- IP66, CSA enclosure type (NEMA) 4X
- Available in two thread lengths: 10mm two drain holes or 15mm three drain holes
- Available in brass, stainless steel and glass-filled nylon
- Metric and NPT threads available

Certifications and compliances:

Code of protection categories:

- ATEX: I M2/II 2 GD, Ex e I/II Mb Gb, Ex tb IIIC Db IP66; nylon: II2GD, Ex e IIGb Ex tb IIIC Db IP66
- IECEX: Ex e I/II Mb/Gb, Ex tb IIIC Db IP66; nylon: Ex e IIC Gb, Ex tb Db IP66
- EAC: ExelU nylon, ExellU IP66
- CSA: Class I, Zone 1, Ex e II IP66, CSA enclosure type 4X (NEMA 4X)

Compliance standards:

- ATEX: EN 60079-0, EN 60079-7, EN 60079-31
- IECEX: IEC 60079-0, IEC 60079-7, IEC 60079-31
- CSA: CSA standard C22.2 No. 0-M, CSA standard C22.2 No. 0.5, CSA standard C22.2 No. 94, CAN/CSA E79-7-95, UL2279

Certificate details:

- ATEX: ITS16 ATEX101338X
- IECEX: IECEX ITS 16.0014X
- EAC: TR RU C-GB.GB06.B.00106
- CSA: 185887-2500003408 (LR106084)

Standard materials:

- Brass CZ121
- 316 stainless steel
- Aluminum
- Glass-filled nylon

Plating options:

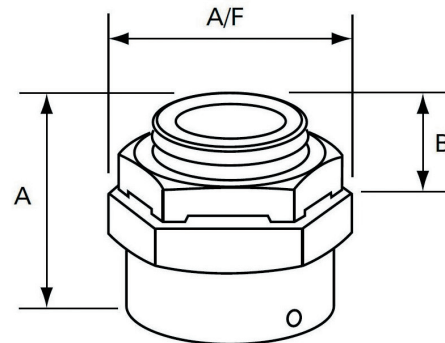
- Electroless nickel
- Zinc
- Others on application

Temperature ratings:

- Metallic body dependent on filter and seal material
- Nylon body: -50°C to +125°C, unless limited by filter material
- HDPE filter: -50°C to 85°C
- Metallic filter dependent on body and interface material
- Nitrile: -30°C to +100°C (supplied as standard)



Dimensions (in inches):



Size	A/F	Minimum overall length (A)	Minimum thread length (B)
M20	1.13	0.91	0.39
M25	1.37	0.91	0.39
M32	1.63	0.91	0.39
1/2" NPT	1.13	1.10	0.59
3/4" NPT	1.37	1.10	0.59
1" NPT	1.63	1.10	0.59

Redapt DPE increased safety (Exe) breather/drains

Cl. I, Zone 1, Ex e II
IECEX/ATEX
NEMA 4X
IP66

Ordering information:

Part number example
DPE3029S3

DP

E

3

0

29

S3

Certification

E	Exe I and IIC
----------	---------------

Material

1	Brass
3	Stainless steel
4	Glass-filled nylon ^A

Plating

0	Unplated
1	Electroless nickel
2	Zinc

Thread type

04	M20
05	M25
06	M32
29	½" NPT
30	¾" NPT
31	1" NPT

Thread length

S1	10mm, 2 holes, with castellated locknut
S2	10mm, 2 holes, without castellated locknut
S3	15mm, 3 holes, with castellated locknut
S4	15mm, 3 holes, without castellated locknut

Note: NPT threaded breather/drains are only available in S3 and S4 options.



POLYWATER® LZ PERFORMANCE LUBRICANT

DESCRIPTION

Polywater® LZ Lubricant is a high-performance, cable pulling lubricant. Polywater LZ is compatible with a broad variety of LSZH/LSHF compounds. Polywater LZ is also compatible with other high-performance cable jackets. It provides excellent tension reduction and is recommended for all types of cable pulling.

Polywater LZ is slow drying and leaves a thin, slippery film that retains its lubricity for months after use. Polywater LZ does not sustain flame when used with fire-retardant cables and systems. Its dried residue is nonconductive and noncombustible.

Polywater LZ is a stringy gel. It can be applied by hand or using Polywater’s LP-D5 Pump. It is also available in the unique Front End Pack™ prelubrication bags.

FRICITION TESTING

Lubricity: Polywater LZ shows superior friction reduction on a variety of jacket types. Typical friction coefficients at 200 lbs/ft (2.91 kN/m) normal pressure are shown. Test results are based on the method described in the white paper, “Coefficient of Friction Measurement on Polywater’s Friction Table, 2007” (polywater.com/FTable.pdf). Values are averages based on cable jacket and conduit materials from multiple manufacturers.

CABLE JACKET	CONDUIT TYPE				
	STEEL	FRP	HDPE	PVC	EMT
LSZH	.16	.17	.07	.08	.21
CSPE	.21	.24	.12	.16	.24
CPE	.15	.19	.09	.10	.17
XLPE	.13	.12	.06	.06	.12
LLDPE	.10	.11	.05	.06	.13

Coefficient of friction data on additional or specific cable jackets or conduits can be obtained from American Polywater Corporation.



Polywater LZ is a specification grade lubricant

PRODUCT FEATURES

- **Low Friction Coefficient:** Maximum tension reduction on all types of cable jackets.
- **Universal:** Suitable for all types of jackets and cable, including power, control, and instrumentation cable.
- **Low-Smoke Zero Halogen (LSZH/LSHF) Compatible:** Extensively tested on LSZH/LSHF thermoplastic and thermoset jackets.

END USE

Polywater LZ is a specification grade lubricant that meets the performance requirements of:

- Nuclear and other generation plants
- Mass transit systems and airports
- Oil and petrochemical

OFFICIAL APPROVALS

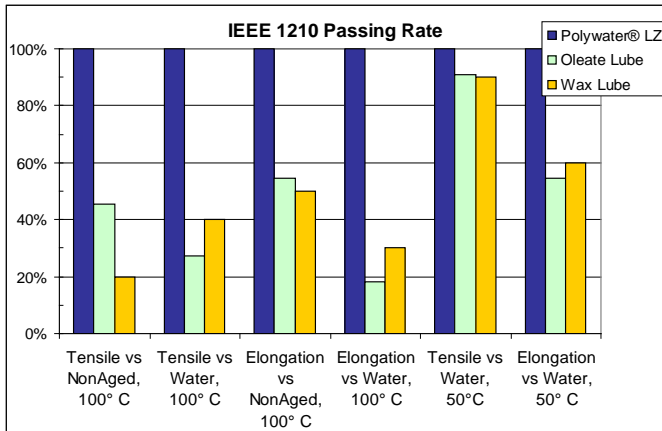
UL Listed
 UL Listed to Canadian safety standards

CABLE COMPATIBILITY

Tensile and Elongation:

LSZH, CSPE, LLDPE, XLPE, CPE, and PVC cable jacket materials aged in Polywater Lubricant LZ per IEEE Standard 1210¹ meet the tensile and elongation retention requirements of that standard.

Modern LSZH jackets are numerous and vary significantly in formulation. Polywater LZ shows broad compatibility with this jacket technology. As shown in the graph below, the common cable pulling lubricants available through local supply houses show significant and sometimes devastating effects on LSZH cable jackets.



Polyethylene Stress Cracking:

Polywater LZ shows no stress cracking on LDPE, MDPE, or HDPE cable jackets when tested per IEEE Standard 1210¹.

Volume Resistivity:

There are no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when volume resistivity is tested according to IEEE Standard 1210¹.

Building Wire Testing:

THHN and XLPE building wire meet UL tensile, elongation, and voltage withstand requirements after exposure to Polywater LZ as tested by UL requirements².

Cable Approvals:

Polywater LZ is approved by many cable manufacturers. Contact American Polywater for details.

¹ IEEE Std 1210-2004; IEEE Standard Tests for Determining Compatibility of Cable-Pulling Lubricants with Wire and Cable.

² UL Subject 267, Investigation for Wire-Pulling Compounds.

PHYSICAL PROPERTIES

PROPERTY	RESULT
Appearance	White, stringy gel
% Nonvolatile solids (weight)	4.0
VOC content	0 gms/L 200 gms/L (Winter Grade)
Viscosity (Brookfield)	35,000–50,000 cps @10 rpm
pH	6.5–7.5

PERFORMANCE PROPERTIES

Cling Factor:

Cling factor is a measure of the ability to apply the lubricant and have it stay on the jacket while the cable enters the conduit.

A six-inch length (152 mm) of a one-inch (25 mm) diameter cable will hold at least 35 grams of Polywater LZ for one minute when held vertically at 70°F (21°C).

Coatability:

Coatability is a measure of the lubricant's ability to coat the jacket as a thin film for continued lubricity on longer pulls.

Polywater LZ will wet out evenly on cable jacket surfaces. It will not bead up or rub off the jacket sample. A one-inch (25 mm) diameter XLPE cable dipped six inches (152 mm) into Polywater LZ, then withdrawn and held vertically, will retain at least 25 grams of Polywater LZ for one minute at 70°F (21°C).

Combustibility:

Combustibility is a measure of combustion properties of the lubricant residue in a fire situation (with an impinging heat flux).

Polywater LZ has no flash point and its dried residue will not support combustion and spread flame. A 15-gram sample of the Polywater LZ, when placed in a one-foot, split, metal conduit and fully dried for 24 hours at 105°C, will not ignite and spread a flame more than three inches beyond the point of ignition when subjected to a continuous heat flux of 85 kW/m². The total test time was 30 minutes.

Test method described in "Fire Parameters and Combustion Properties of Cable Pulling Compound Residues," presented to the International Wire & Cable Symposium, 1987.

APPLICATION PROPERTIES

Application Systems:

Polywater LZ has a stringy gel consistency that makes it easy to lift, carry, and hand apply.

Polywater LZ can also be pumped directly into the conduit or onto the cable using the Polywater LP-D5 specialty lubricant pump. This allows hands-free transfer and consistent application of lubricant. Polywater's low-shear pump will not change the gel character of Polywater LZ. The LP-D5 pump applies lubricant at a rate of 1–2 gallons (4–8 liters) per minute.

Polywater LZ Front End Packs are bag packages that “prelubricate” the head end of the cable during the pull. The Front End Pack attaches to the winch line and prelubricates as it goes through the conduit. Two sizes are available to fit 2” and larger conduits.

Pull-Planner™ Tension Calculation Software is available from Polywater. Pulling tension estimations can ensure the use of appropriate pulling equipment and that the cable is installed within safe limits.

Polywater LZ is also available in a special-order, pourable version (lower viscosity) called Polywater PLZ.

Temperature Use Range:

Polywater LZ:

20°F to 120°F (-5°C to 50°C).

Polywater WLZ (Winter Grade version):

-20°F to 120°F (-30°C to 50°C)

Temperature Stability:

Polywater LZ will not phase-out or separate after five freeze/thaw cycles or 5-day exposure at 120°F (50°C).

Cleanup:

Polywater LZ is nonstaining. Complete cleanup is possible with water.

Storage and Shelf Life:

Store Polywater LZ in a tightly sealed container away from direct sunlight. Lubricant shelf life is 24 months.

DIRECTIONS FOR USE

Polywater LZ can be hand applied or pumped onto the cable as it enters the conduit.

For long pulls, place approximately two-thirds of the recommended quantity of lubricant into the conduit using the Front End Packs or by pumping.

For Front End Packs use, attach the packs of Polywater LZ to the winch line or pulling rope in front of the cable by using tape or cable ties. Start the pull and slit open the entire length of the pack(s) with a sharp knife as it enters the conduit.

Supplement with direct jacket lubrication as the cable enters the conduit.

Clean up by wiping off any excess lubricant with a rag.

Recommended Lubricant Quantity:

$$Q = k \times L \times D$$

Where:

Q = quantity in gallons (liters)

L = length of conduit run in feet (meters)

D = ID of the conduit in inches (mm)

k = 0.0015 (0.0008 if metric units)

The quantity that is appropriate for any given pull can vary from this recommendation by 50%, depending on the complexity of the pull. Consider the following factors:

Cable weight and stiffness

(Increase quantity for stiff, heavy cable)

Conduit condition

(Increase quantity for old, dirty, or rough conduits)

Conduit fill

(Increase quantity for high percent conduit fill)

Number of bends

(Increase quantity for pulls with several bends)

Pulling environment

(Increase quantity for high temperatures)

MODEL SPECIFICATION

The statement below may be inserted into a specific job specification to help maintain engineering standards and ensure project integrity.

The cable pulling lubricant shall be Polywater® LZ Lubricant. The cable pulling lubricant shall provide excellent friction reduction with good cling and wetting through long pulls and multiple bends. The lubricant shall leave minimal, noncombustible residue. It shall be compatible with most cable jacket materials and be extensively tested on a broad variety of low smoke, halogen-free cable jacket materials.

Cable jacket compatibility shall be tested with the specific LSZH jacket material used on the cable. Test data shall be provided by the cable manufacturer or the lubricant manufacturer. It shall not stress crack polyethylene per ASTM Standard 1693. There shall be no significant changes in the conductive properties of XLPE and EPR semi-conducting compounds when the lubricant's effect on volume resistivity is tested according to IEEE Standard 1210.

A 15-gram sample of the lubricant, when placed in a one-foot, split metal conduit and fully dried for 24 hours at 105 degrees C, shall not spread a flame more than three inches beyond a point of ignition at a continued heat flux of 85 kW/meter². Total time of test shall be 30 minutes.

ORDER INFORMATION

CAT #	PACKAGE DESCRIPTION
LZ-55	½-gal. bag in a box (1.9 liters) 6/case
LZ-110	½-gal. bag in a pail (1.9 liters) 10/pail
LZ-35	1-qt. squeeze bottle (.95 liter) 12/case
LZ-128	1-gal. pail (3.78 liter) 4/case
LZ-640	5-gal. pail (18.9 liter)
LZ-DRUM	55-gal. drum (208 liter)
	Winter Grade
WLZ-55	½-gal. bag in a box (1.9 liters) 6/case
WLZ-110	½-gal. bag in a pail (1.9 liters) 10/pail
WLZ-35	1-qt. squeeze bottle (.95 liter) 12/case
WLZ-128	1-gal. pail (3.78 liter) 4/case
WLZ-640	5-gal. pail (18.9 liter)

IMPORTANT NOTICE: The statements here are made in good faith based on tests and observations we believe to be reliable. However, the completeness and accuracy of the information is not guaranteed. Before using, the end-user should conduct whatever evaluations are necessary to determine that the product is suitable for the intended use.

American Polywater expressly disclaims any implied warranties and conditions of merchantability and fitness for a particular purpose. American Polywater's only obligation shall be to replace such quantity of the product proven to be defective. Except for the replacement remedy, American Polywater shall not be liable for any loss, injury, or direct, indirect, or consequential damages resulting from product's use, regardless of the legal theory asserted.

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